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May 25, 2006
Date of Signature

Re:	Application of:	Jacobs et al.
	Serial No.:	10/609,007
	Filed:	June 27, 2003
	For:	Valve Calibration Method and Apparatus
	Group Art Unit:	3753
	Examiner:	Ramesh Krishnamurthy
	Our Docket No.:	1867-0020

TRANSMITTAL OF BRIEF ON APPEAL (Supplemental)

Please find for filing in connection with the above patent application the following documents:

1. Supplemental Appeal Brief; and

2. One (1) return post card.

This is a reinstatement of a previous Appeal filed February 7, 2006.

In compliance with MPEP 1204.01, we ask that the Commissioner apply the previously paid appeal fee to the Supplemental Appeal Brief herewith, as no final Board decision has been made in the Appeal filed February 7, 2006. However, please charge any deficiency, or credit any overpayment to Deposit Account No. 13-0014.

Respectfully Submitted,

MAGINOT, MOORE & BECK, LLP

May 25, 2006

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Enclosures

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	Siemens Docket No.:	2002P10431US01

BRIEF ON APPEAL (Supplemental)

Sir:

This is an appeal under 37 CFR § 41.31 to the Board of Patent Appeals and Interferences of the United States Patent and Trademark Office from the rejection of claims 1-30 of the above-identified patent application. Claims 1-26 were finally rejected in the Office Action dated September 7, 2005.

This is a supplemental appeal brief. This Supplemental Appeal Brief was required because the Examiner did not like the wording of the Evidence Appendix and Related

Proceedings Appendix. Both sections *were* included in the original Appeal Brief, and both sections are and were empty.

A check in the amount of **$500.00** was enclosed with the original Appeal Brief dated February 7, 2006 to cover the fee required under 37 CFR § 41.20(b)(2). Also, please provide any extension of time which may be necessary and charge any fees which may be due to Deposit Account No. 13-0014, but not to include any payment of issue fees.

(1) REAL PARTY IN INTEREST

Siemens Building Technologies, Inc. is the owner of this patent application, and therefore the real party in interest.

(2) RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences in this case.

(3) STATUS OF CLAIMS

Claims 1-26 are pending in the application.

Claims 1-26 stand rejected and form the subject matter of this appeal. Claims 1-26 are shown in the Appendix attached to this Appeal Brief.

(4) STATUS OF AMENDMENTS

Applicants filed a Response to Office Action dated June 22, 2005 ("Response") responsive to an Office Action dated March 22, 2005. A final Office Action dated September 7, 2005 ("Final Office Action") was designated by the Examiner to be

responsive to the Response.

(5) SUMMARY OF THE CLAIMED SUBJECT MATTER

Claim 1 is directed to an arrangement that uses a processing circuit to calibrate a Venturi valve. The arrangement includes a source of flow measurements and a processing circuit. (See, e.g., flow sensor 110 and processing circuit 106 of Fig. 1). The processing circuit is configured to provide a plurality of voltages to an actuator, and to obtain measurements of the resulting flow. (See, e.g., actuator 108 of Fig. 1; see also steps 208-214 of Fig. 2 described in the specification at p.12, line 10 to p.13, line 18). The processing circuit also stores information representative of the relationship between actuator voltage and measured flow. (See *id.*, wherein the measured flow values and the actuator voltages are stored in a flow voltage table 107 of Fig. 1).

Claim 11 is directed to a method of calibrating a Venturi valve. The Venturi valve has a variable shaft position and is operable to provide an air flow corresponding to the variable shaft position. (See, e.g., valve 104 of Fig. 1 and specification at p.6, line 13 to p.7, line 7). The method includes installing the Venturi valve in a facility. (See, e.g., *id.* at p.6, lines 7-12; p.3, lines 20-22; p.5, lines 3-5). After installing the Venturi valve, a plurality of voltages are provided to an actuator. The actuator is operable to change the variable shaft position dependent on said plurality of voltages. (See, e.g. *id.* at p.7, lines 8-10 and Fig. 2, steps 208-214). The method also includes receiving from a source of flow measurements a flow measure for each variable shaft position corresponding to each of the plurality of voltages. (See, e.g., *id.* at Fig. 2, steps 208-214) The method further includes

storing information representative of the relationship between each of the plurality of voltages and the flow measures. (See, e.g., steps 208-214 of Fig. 2 described in the specification at p.12, line 10 to p.13, line 18; and flow voltage table 107 of Fig. 1). The method also includes using the Venturi valve as a part of a system that regulates air flow within the facility. (See, e.g. *id.* at p.6, lines 7-12; See Fig. 7 and specification at p.19, lines 16-20).

Thus, the method of claim 11 includes installing a Venturi valve in a position within a facility, calibrating the valve in that position, and then using the valve as part of a system that regulates air flow in the *same* facility. As discussed in the background and summary of the invention, this method eliminates inaccuracies that are due to off-site (factory) calibration. (Specification at p.3, lines 9-22).

Claim 17 is directed to a method of calibrating a Venturi valve. The Venturi valve has a variable shaft position and is operable to provide an air flow corresponding to the variable shaft position. (See, e.g., valve 104 of Fig. 1 and specification at p.6, line 13 to p.7, line 7). The method includes determining a first actuator voltage associated with a predetermined first flow value. (See, e.g., determination of V1, which corresponds to a predetermined value 0.95**MAX_FLOW*, discussed in specification at p.12, lines 5-13). The method also includes determining a second actuator voltage associated with a predetermined second flow value. (See, e.g., determination of V2, which corresponds to a predetermined "minimum rated controllable flow value", discussed in specification at p.12, lines 16-23).

The method also includes providing a set of other voltages to the actuator and obtaining a corresponding flow measurement for each of the set of other voltages, the set of other voltages being between the first actuator voltage and the second actuator voltage. (See, e.g, step 214 of Fig. 2 and specification at p.13, lines 7-14). The method further includes storing information representative of the relationship between each of a plurality of voltages and the flow measures, the plurality of voltages including the first actuator voltage, the second actuator voltage and the set of other voltages. (See, e.g., specification at p.12, lines 10-12; p.12 line 23 to p.13; line 2, and p.13, lines 13-15).

Thus, the above described method finds two voltages that correspond to preselected or predetermined flow values. The method then applies various voltages that are between the two "found" voltages, and obtains associated flow measurements.

Claim 21 is directed to an arrangement for calibrating a valve, the valve having a variable shaft position, the valve operable to provide a flow corresponding to the variable shaft position. (See, e.g., arrangement 102 of Fig. 1; See also specification at p.6, lines 7-9). The arrangement includes a source of flow measurements and a processing circuit. (See, e.g., flow sensor 110 and processing circuit 106 of Fig. 1). The processing circuit is operable to provide a plurality of voltages to an actuator, the actuator operable to change the variable shaft position dependent on said plurality of voltages. (See, e.g. the actuator 108 of Fig. 1; see specification at p.7, lines 8-12 and p.8, lines 13-15). The processing circuit is further operable to receive from the source of flow measurements a flow measure for each variable shaft position corresponding to each of the plurality of voltages. (See, e.g., *id.* at p.8, lines 15-17). The processing circuit is also operable to store information

representative of the relationship between each of the plurality of voltages and the flow measures. (See, e.g., *id.* at p.8, lines 17-21 and steps 208-214 of Fig. 2).

(6) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 1, 3-5, 7-11, 13-15, 17-21 and 23-26 stand rejected under 35 U.S.C. §102(b) as allegedly being anticipated by U.S. Patent No. 5,304,093 to Sharp (hereinafter "Sharp");

Claims 2, 6, 12, 16 and 22 stand rejected under 35 U.S.C. §103(a) as allegedly being obvious over Sharp in view of European Patent No. EP 0834723 to Emerson Electric Company (hereinafter "Emerson").

(7) ARGUMENT

A. <u>The Anticipation Rejection of Claim 1</u>

Sharp fails to disclose each and every element of claim 1. For example, Sharp fails to disclose a processing circuit the performs the calibration operations of claim 1. In particular, Sharp fails to disclose a processing circuit that provides a plurality of voltages to an actuator, receives a flow measure corresponding to each of the plurality of voltages, and stores information representative of the relationship between the voltages and flow measures, as claimed.

Although Sharp does teach using calibration data, and also teaches a processing circuit 55 that performs actual control operations, Sharp fails to teach an arrangement for calibration using the processing circuit 55 in the manner claimed by the Applicants.

As an initial matter, it is noted that Sharp discloses very little about calibration of the Venturi valve. In fact, Sharp only addresses calibration in three passages. The first passage is:

> The result of the Venturi valve's cone and spring pressure compensating action is that there is a specific and fixed relationship or characteristic between the valve's shaft position and the fluid flow through the valve. To the extent that this characteristic is not predetermined for a given valve, it may be empirically determined for the valve in a given application by performing an initial calibration procedure. Once the characteristic is known, all that is required to achieve a desired airflow is to move the valve shaft to the appropriate position for such airflow.

(Sharp, col. 1, line 59). The second passage is: "Accuracy is limited only by the accuracy of the calibration data . . ." (Sharp, col. 2, line 4). The third passage is: "the characteristic of shaft position to air flow through valve 16 is predictable and calibratable." (Sharp, col. 4, line 63).

Thus, while Sharp certainly acknowledges that calibration must at some time be performed, Sharp does not disclose use of a processing circuit for calibration, much less a processing circuit that 1) causes voltages to be applied, 2) obtains flow measurements, and 3) stores information representative of the relationship between each of the voltages and the flow measures. Using a processing circuit to perform all of these three steps of calibration is not inherent to "performing an initial calibration procedure", as disclosed by Sharp. The calibration discussed in Sharp may be carried out in many ways that do *not* involve the use of a processing circuit *as claimed.* For example, one or more of the calibration steps may be carried out manually, or under the control of different processing circuits.

As a consequence, Sharp does not inherently teach the use of a processing circuit to cause voltages to be applied, to obtain flow measurements, and to store information representative of the relationship between each of the voltages and the flow measures is not inherently taught by the above passages of Sharp.

It is noted that the Examiner does identify that Sharp discloses a processing circuit 55. However, nothing in Sharp attributes *any* calibration steps, much less the claimed calibration steps, to the processing circuit 55 of Fig. 2. Sharp only discloses that the processing circuit 55 is used for process control, not calibration. Moreover, it is not inherent that the processing circuit used for normal control (i.e. circuit 55 of Sharp) would necessarily be used to coordinate and control the calibration operation. As discussed above, one or more of the calibration steps may be performed manually, or by another independent processing circuit.

Accordingly, Sharp fails to disclose or suggest a processing circuit that is operable to cause voltages to be applied, obtain flow measurements, and store information as claimed. Sharp therefore does not teach or disclose each and every element of claim 1. As a consequence, it is respectfully submitted that the rejection of claim 1 as anticipated by Sharp is in error and should be reversed.

B. Claim 21

Claim 21 was similarly rejected as being anticipated by Sharp. Claim 21 is directed to calibrating a valve using a processing circuit as outlined in claim 1. Thus, claim 21 is directed to subject matter that is similar to the subject matter of claim 1. Therefore, for all of the reasons given above with regard to claim 1, the Applicants submit that claim 21 is also in condition for allowance, which is hereby respectfully requested.

C. Claim 11

Claim 11 similarly stands rejected as allegedly being anticipated by Sharp. Claim 11 is directed to a method of calibrating a Venturi valve that includes a step

of installing the Venturi valve in a facility. According to the claimed method, once the valve is installed, flow measures corresponding to each of a plurality of actuator voltages are obtained, and information representative of the relationship between each voltage and flow measure is stored. Thereafter, the Venturi valve is used as part of the air flow regulation operations in the facility.

Thus, claim 11 recites an *in situ* calibration procedure. By *in situ,* it is meant that the device is both calibrated in, *and* used as part of a system that performs air flow regulation operations in, the *same* facility. Thus, claim 11 is directed to one of the advantages of the present invention. This advantage includes the potential removal of some errors that would otherwise result from calibration at the factory, or some other place other than where the device is actually used.

By contrast, Sharp does not teach or suggest "installing the Venturi valve in a facility" *and subsequently* "storing information representative of the relationship between each of the plurality of voltages and the flow measures" as claimed, and then "using the Venturi valve as a part of a system that regulates air flow within the facility". In other words, Sharp does not teach *in-situ* calibration.

As discussed above, Sharp only mentions that the valve shaft – air flow relationship "may be empirically determined for the valve in a given application by performing an initial calibration procedure". Sharp does not teach that this "initial calibration procedure" is performed *after* the valve is installed in the facility where the valve is to be used as part of an air flow regulation system.

As with claims 1 and 11, the Examiner appears to rely heavily on inherency to provide the missing teaching of calibrating after installation into the facility in

which the valve is to be used as part of the air flow regulation system. In particular, the Examiner stated that "since the calibration curve is being utilized to position the valve to produce a desired flow, such calibration necessarily refers to an in-situ calibration." (Final Office Action at p.4).

Applicants disagree. The Examiner appears to be contending that ordinary calibration of a Venturi valve is inherently (i.e. always) performed *in-situ*. In other words, the Examiner appears to allege that since Sharp teaches calibration of the Venturi valve, such calibration must necessarily be done *in-situ*. This is incorrect. As evidenced by the Specification of the application at p.3, lines 9-14, Venturi valve calibration was routinely performed "off-line", for example, in the manufacturing facility using special calibration fixtures. Thus, calibration does not necessarily occur in the same facility as that in which the Venturi valve is used as part of a system that performs air flow regulation operations, as claimed.

As a result, the mere fact that Sharp mentions calibration does not constitute an inherent teaching that Sharp performs such calibration after it has been installed in the facility in which it will operate as part of a flow control regulation system for the facility.

Furthermore, it would be impossible to perform the calibration operation of claim 11 in Sharp because the Venturi valve arrangement illustrated in Sharp does *not* include a flow measurement device, which would otherwise be necessary for calibration. As a consequence, to the extent that Sharp teaches calibration using a flow meter at all, Sharp teaches that such calibration must be performed *pre-installation*.

Therefore, Sharp fails to teach or suggest each and every element of claim 11. Sharp fails to disclose calibrating the Venturi valve in the facility in which it is ultimately used for air flow control. It is therefore respectfully submitted that the rejection of claim 11 over Sharp is in error and should be reversed.

D. Claim 17

Claims 17 similarly stands rejected as anticipated by Sharp. Sharp fails to disclose determining first and second actuator voltages associated with *predetermined* first and second flow values, as recited in claim 17.

In particular, claim 17 is directed to a Venturi valve calibration method that includes determining first and second actuator voltages associated with *predetermined* first and second flow values, respectively. The method further includes applying a set of other voltages and obtaining the corresponding flow measurements, wherein the other voltages are *between* the determined first and second actuator voltages. This method therefore encompasses more than merely obtaining flow values corresponding to a set of test input voltages. The claimed method recites the determination of two input values that correspond to predetermined output values, and *then* obtaining other output values corresponding to a set of other input values.

Sharp fails to disclose any such steps. As discussed above, Sharp provides very little information in the way of details regarding calibration. Sharp certainly does not teach determining an actuator voltage for each of two different *predetermined* flow rate values. At best, Sharp inherently teaches that different shaft positions should be correlated to different flow rates. Sharp does not teach finding a shaft position, much less an actuator

voltage, corresponding to a *predetermined flow rate* during the calibration process, as is claimed.

Furthermore, determining actuator voltages for predetermined flow rates in calibration is not inherent to an ordinary calibration operation. In many cases, calibration is merely carried out by applying an input value range and measuring the output values to develop the relationship between the two. The extra step of determining two input voltage values that correspond to predetermined flow rates is not inherent to that process.

Accordingly, Sharp does not suggest or even vaguely imply, expressly or inherently, a method that involves determining first and second voltages corresponding to first and second *predetermined* flow values, and then applying voltages between the first and second voltages to obtain additional (non-predetermined) flow values.

As a consequence, it is respectfully submitted that Sharp fails to teach or suggest each and every element of claim 17 as amended. It is therefore respectfully submitted that the rejection of claim 17 should be reversed.

E. The Anticipation Rejection of Claims 3-5 and 7-10

Claims 3-5 and 7-10 stand rejected as allegedly being anticipated by Sharp. Claims 3-5 and 7-10 all depend from and incorporate all of the limitations of claim 1. Accordingly, for at least the same reasons as those set forth above in connection with claim 1, it is respectfully submitted that the anticipation rejection of 3-5 and 7-10 over Sharp should be reversed.

F. The Anticipation Rejection of Claims 13-15

Claims 13-15 stand rejected as allegedly being anticipated by Sharp. Claims 13-15 all depend from and incorporate all of the limitations of claim 11. Accordingly, for at least the same reasons as those set forth above in connection with claim 11, it is respectfully submitted that the anticipation rejection of 13-15 over Sharp should be reversed.

G. <u>The Anticipation Rejection of Claims 18-20</u>

Claims 18-20 stand rejected as allegedly being anticipated by Sharp. Claims 18-20 all depend from and incorporate all of the limitations of claim 17. Accordingly, for at least the same reasons as those set forth above in connection with claim 17, it is respectfully submitted that the anticipation rejection of 18-20 over Sharp should be reversed.

H. <u>The Anticipation Rejection of Claims 23-26</u>

Claims 23-26 stand rejected as allegedly being anticipated by Sharp. Claims 23-26 all depend from and incorporate all of the limitations of claim 20. Accordingly, for at least the same reasons as those set forth above in connection with claim 20, it is respectfully submitted that the anticipation rejection of 23-26 over Sharp should be reversed.

I. <u>The Obviousness Rejections of Claims 2, 6, 12, 16 and 22</u>

The Examiner rejected claims 2, 6, 12, 16 and 22 under 35 U.S.C. 103(a) as allegedly being obvious over Sharp and over Sharp in view of Emerson. For reasons that will be discussed below, it is submitted that even if it were appropriate to modify the method of Sharp as proposed by the Examiner, which it is not, the resulting modified

method and apparatus of Sharp would fail to arrive at the inventions of any of claims 2, 6, 12, 16 and 22.

In particular, each of claims 2, 6, 12, 16 and 22 depend from and incorporate all of the limitations of one of claims 1, 11 and 20. As discussed above in detail, Sharp fails to teach or suggest each and every limitation of any of claims 1, 11 and 20. Even if Sharp were modified as proposed by the Examiner in connection with the rejection of claims 2, 6, 12, 16 and 22, the resulting combination would not arrive at the inventions of any of claims 1, 11 and 20. Thus, the proposed modification of Sharp does not arrive at the inventions of claims 2, 6, 12, 16 and 22.

More specifically, Emerson is recited as teaching the addition of a verification step. The Examiner also appears to allege that Emerson teaches, inherently, application of test voltages in a particular sequence. (Final Office action at pp.3-4, citing Emerson at page 6, lines 55-58). At page 6, lines 55-58, Emerson states:

> If the instrument is an analog instrument, then the instrument is constructed and a calibration is performed on the instrument using nitrogen gas, for example. This calibration is then matched to a companion curve generated from the stored flow data for the process fluid. This is step S4. At step S5, a quality control check is performed to verify that the companion curve does match. If there is verification, then the instrument is shipped as indicated at step S6.

At best, Emerson teaches a "quality control" step is performed after the calibration curve fitting operation. The addition of a quality control step after the calibration curve fitting of Sharp does not address the shortcomings of Sharp with respect to independent claims 1, 11 and 21.

Accordingly, because the proposed modification of Sharp does not arrive at the inventions of 2, 6, 12, 16 and 22, it is respectfully submitted that the obviousness rejection of those claims is in error and should be withdrawn.

(8) CONCLUSION

For all of the foregoing reasons, claims 1-26 are not unpatentable. As a consequence, the Board of Appeals is respectfully requested to reverse the rejection of these claims.

Respectfully submitted,

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CLAIM APPENDIX

1. An arrangement for calibrating a Venturi valve, the Venturi valve having a variable shaft position, the Venturi valve operable to provide an air flow corresponding to the variable shaft position, the arrangement comprising:

a source of flow measurements; and

a processing circuit operable to

provide a plurality of voltages to an actuator, the actuator operable to change the variable shaft position dependent on said plurality of voltages,

receive from the source of flow measurements a flow measure for each variable shaft position corresponding to each of the plurality of voltages, and

store information representative of the relationship between each of the plurality of voltages and the flow measures.

2. The arrangement of claim 1 wherein the processing circuit is further operable to:

provide first plural test voltages to the actuator to determine a first voltage of the plurality of voltages associated with a first measured flow value;

after determining the first voltage, provide second plural test voltages to the actuator to determine a second of the plurality of voltages associated with a second measured flow value;

after determining the second voltage, provide a set of other voltages to the actuator, and obtain a corresponding flow measurement for each of the set of other voltages, the set of other voltages being between the first voltage and the second voltage; and

wherein the plurality of voltages includes the first voltage, the second voltage and the set of other voltages.

3. The arrangement of claim 1 wherein the processing circuit includes a controller operably coupled to receive a flow set point from an external device, the controller further operable to cause a select output voltage to be provided to the actuator, the select output voltage based at least in part on the flow set point and the stored information.

4. The arrangement of claim 1 wherein the processing circuit is further operable to store information representative of the relationship between each of the plurality of voltages and the flow measures in the form a table that identifies a correspondence between each of the plurality of voltages and the corresponding flow measure.

5. The arrangement of claim 1 wherein a voltage difference between a first set of voltages in the plurality of voltages is greater than a voltage difference between a second set of voltages in the plurality of voltages.

6. The arrangement of claim 1 wherein the processing circuit is further operable to store information representative of the relationship between each of the plurality of voltages and the flow measures by:

obtaining candidate information representative of the relationship;

performing a verification operation on the candidate information;

storing information representative of the relationship between each on the plurality of voltages and the flow measures based on a set of verified candidate information.

7. The arrangement of claim 1 wherein the processing circuit is further operable to:

determine a first voltage associated with a first flow value,

determine a second voltage associated with a second flow value, and

provide a set of other voltages to the actuator and obtaining a corresponding flow measurement for each of the set of other voltages, the set of other voltages being between the first voltage and the second voltage, and

wherein the plurality of voltages includes the first voltage, the second voltage and the set of other voltages.

8. The arrangement of claim 7 wherein the processing circuit is further operable to determine a first voltage by:

providing a maximum voltage to the actuator;

obtaining a maximum flow measure corresponding to the maximum voltage;

determining the first flow value as a fractional portion of the maximum flow measure; and

determining the first voltage associated with the first flow value.

9. The arrangement of claim 7 wherein the second flow value is approximately a rated minimum controllable flow value for the valve.

10. The arrangement of claim 7 wherein the processing circuit is further operable to provide the set of other voltages by:

providing the set of other voltages in an interleaved sequence, wherein the voltage difference between any two voltages provided in the interleaved sequence exceeds the voltage between any two adjacent voltages in the set of other voltages.

11. A method of calibrating a Venturi valve, the Venturi valve having a variable shaft position, the Venturi valve operable to provide an air flow corresponding to the variable shaft position, the method comprising:

a) installing the Venturi valve in a facility;

b) after installing the Venturi valve, providing a plurality of voltages to an actuator, the actuator operable to change the variable shaft position dependent on said plurality of voltages,

c) receiving from a source of flow measurements a flow measure for each variable shaft position corresponding to each of the plurality of voltages,

d) storing information representative of the relationship between each of the plurality of voltages and the flow measures; and

e) using the Venturi valve as a part of a system that regulates air flow within the facility.

12. The method of claim 11 wherein steps b) and c) further comprise:

providing first plural test voltages to the actuator to determine a first voltage of the plurality of voltages associated with a first measured flow value,

providing second plural test voltages to the actuator to determine a second of the plurality of voltages associated with a second measured flow value, and

providing a set of other voltages to the actuator, and obtaining a corresponding flow measurement for each of the set of other voltages, the set of other voltages being between the first voltage and the second voltage, and

wherein the plurality of voltages includes the first voltage, the second voltage and the set of other voltages.

13. The method of claim 11 further comprising:

receiving a flow set point from an external device; and

employing a controller to cause a select output voltage to be provided to the actuator, the select output voltage based at least in part on the flow set point and the stored information.

14. The method of claim 11 wherein step d) further comprises storing information representative of the relationship between each of the plurality of voltages and the flow measures in the form a table that identifies a correspondence between each of the plurality of voltages and the corresponding flow measure.

15. The method of claim 14 wherein a voltage difference between a first set of voltages in the plurality of voltages is greater than a voltage difference between a second set of voltages in the plurality of voltages.

16. The method of claim 11 wherein step d) further comprises storing information representative of the relationship between each of the plurality of voltages and the flow measures by:

obtaining candidate information representative of the relationship;

performing a verification operation on the candidate information; and

storing information representative of the relationship between each on the plurality of voltages and the flow measures based on a set of verified candidate information.

17. A method of calibrating a Venturi valve, the Venturi valve having a variable shaft position, the Venturi valve operable to provide an air flow corresponding to the variable shaft position, the method comprising:

a) determining a first actuator voltage associated with a predetermined first flow value;

b) determining a second actuator voltage associated with a predetermined second flow value;

c) providing a set of other voltages to the actuator and obtaining a corresponding flow measurement for each of the set of other voltages, the set of other voltages being between the first actuator voltage and the second actuator voltage; and

d) storing information representative of the relationship between each of a plurality of voltages and the flow measures, the plurality of voltages including the first actuator voltage, the second actuator voltage and the set of other voltages.

18. The method of claim 17 wherein step a) further comprises:

providing a maximum voltage to the actuator;

obtaining a maximum flow measure corresponding to the maximum voltage;

determining the first flow value as a fractional portion of the maximum flow measure; and

determining the first voltage associated with the first flow value.

19. The method of claim 17 wherein the second flow value is approximately equal to a rated minimum controllable flow value for the valve.

20. The method of claim 17 wherein step c) further comprises:

providing the set of other voltages in an interleaved sequence, wherein the voltage difference between any two voltages provided in the interleaved sequence exceeds the voltage between any two adjacent voltages in the set of other voltages.

21. An arrangement for calibrating a valve, the valve having a variable shaft position, the valve operable to provide a flow corresponding to the variable shaft position, the arrangement comprising:

a source of flow measurements; and

a processing circuit operable to

provide a plurality of voltages to an actuator, the actuator operable to change the variable shaft position dependent on said plurality of voltages,

receive from the source of flow measurements a flow measure for each variable shaft position corresponding to each of the plurality of voltages, and

store information representative of the relationship between each of the plurality of voltages and the flow measures.

22. The arrangement of claim 21 wherein the processing circuit is further operable to:

provide first plural test voltages to the actuator to determine a first voltage of the plurality of voltages associated with a first measured flow value;

after determining the first voltage, provide second plural test voltages to the actuator to determine a second of the plurality of voltages associated with a second measured flow value;

after determining the second voltage, provide a set of other voltages to the actuator, and obtaining a corresponding flow measurement for each of the set of other voltages, the set of other voltages being between the first voltage and the second voltage; and

wherein the plurality of voltages includes the first voltage, the second voltage and the set of other voltages.

23. The arrangement of claim 21 wherein the valve is an air flow valve.

24. The arrangement of claim 23 wherein the valve is a regulated output air flow valve.

25. The arrangement of claim 21 wherein the processing circuit is further operable to:

determine a first voltage associated with a first flow value,

determine a second voltage associated with a second flow value, and

provide a set of other voltages to the actuator and obtaining a corresponding flow measurement for each of the set of other voltages, the set of other voltages being between the first voltage and the second voltage, and

wherein the plurality of voltages includes the first voltage, the second voltage and the set of other voltages.

26. The arrangement of claim 25 wherein the processing circuit is further operable to provide the set of other voltages by:

providing the set of other voltages in an interleaved sequence, wherein the voltage difference between any two voltages provided in the interleaved sequence exceeds the voltage between any two adjacent voltages in the set of other voltages.

EVIDENCE APPENDIX

This section is empty

[NONE]

RELATED PROCEEDINGS APPENDIX

This section is empty

[NONE]